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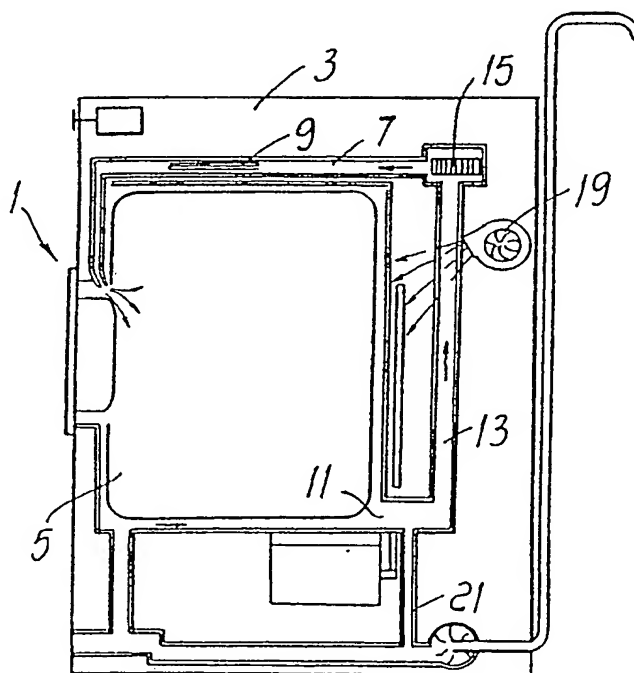
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(54) Title: WATER ECONOMIZER FOR COMBINED WASHING-DRYING MACHINES



(57) Abstract

An economizer which includes one or more fans (19) suitable to blow air onto the washing tank (5) so as to condense the moisture and consequently dry the laundry without using water.

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WATER ECONOMIZER FOR COMBINED WASHING-DRYING MACHINES

The present invention relates to a water economizer for combined washing-drying machines.

5

Combined washing-drying machines with closed-circuit air circulation are known which include an air circulation device that is activated at the end of the washing cycle and of the spin-drying and dries the laundry completely.

10

Various air circulation devices are known. In a first type, the air enters the tank in which the laundry is heated by a radiating unit, removes the moisture, passes through the holes of the drum along the discharge ducts, and finally rises to the fan, which pushes the air back into the tank. The air, by passing through the warm laundry, removes the moisture and, by passing in the recirculation duct, makes contact with the water, cools down and releases moisture. By continuing this cycle for 70-120 minutes, the laundry is dried completely.

20

In a second type of device, the air is propelled by a fan through a heating unit and is then fed into the basket, where it makes contact with the wet laundry, removes water and becomes moisture-laden. Subsequently the moist air passes in the recirculation duct, which is appropriately cooled with water, and deposits the moisture and repeats the cycle. This cooling duct is termed condenser.

25

Naturally, the condensed water, together with the cooling

30

water, is eliminated from the machine by means of the discharge duct.

Other systems, substantially similar to those described
5 above, entail the introduction of air and heat into the laundry, which releases moisture into the air; this air is fed into a condenser kept cool by water, where it releases the moisture. By repeating this cycle for some time the laundry is dried.

10

An essential component of these drying systems is the condenser, in which the air, in contact with cold water, releases moisture. The condenser is normally constituted by a substantially vertical duct in which the stream of hot and
15 moist air that arrives from below is struck by a film of water that arrives from above and cools it, consequently condensing the moisture present in the duct. The water also traps and removes the lint of the laundry which is suspended in the drying air and tends to deposit along the walls. This
20 lint is then eliminated together with the discharge water.

The water thus acts as a cooling means and as a means for washing the condensation ducts in known drying systems. Since the drying cycle is rather long (approximately 60 to 120
25 minutes) in conventional machines, there is a considerable consumption of water, ranging from 40 to 70 liters for each drying cycle.

The aim of the present invention is to provide an economizer
30 for combined washing-drying machines which greatly reduces,

or eliminates, water consumption during the drying of the laundry.

Within the scope of this aim, an object of the invention is
5 to provide a device which is suitable to be applied together with an economizer of the type described in the Italian patent application no. MI92A000404 filed in the name of this same Applicant.

10 This aim, this object and others which will become apparent hereinafter are achieved by a water economizer for combined washing-drying machines which include a washing tank, characterized in that it includes a fan means which is
15 suitable to send air onto the parts of the machine which contain air and vapor so as to cool them, with consequent condensation of the vapor for the drying of the laundry.

Further characteristics and advantages will become apparent from the description of a preferred but not exclusive
20 embodiment of the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figures 1-6 are sectional lateral elevation views of a combined washing-drying machine respectively according to six
25 aspects of the invention.

With reference to the above figures, a combined washing-drying machine 1, 101, 201, 301, 401, 501 generally includes a supporting structure 3, 103, 203, 303, 403, 503 for a tank
30 5, 105, 205, 305, 405, 505 which is suitable to contain the

laundry to be washed and dried.

The air circulation and drying system includes a duct 7, 107, 207, 307, 407, 507 for delivering the hot air and an electric
5 resistor 9, 109, 209, 309, 409, 509 for heating this air, which is sent to the tank in a per se known manner.

The machine also includes an intake duct 11, 111, 211, 311, 411, 511 which is suitable to connect the tank 5,
10 505 to a condenser 13, 113, 213, 313, 413, 513 which is in turn connected to an aspirator 15, 115, 215, 315, 415, 515, and to the delivery duct 7,, 507 in a per se known manner.

15 A discharge duct 21, 121, 221, 321, 421, 521 is connected to the tank to discharge the water and to the condenser.

According to a first embodiment of the invention, with particular reference to Figure 1, the machine includes a fan
20 19 located in the supporting structure 3 so as to strike the tank 5 with a stream of cold air. At the end of the washing cycle, the tank is thus cooled and the moisture present in the air contained in the tank condenses on the inner walls of the tank.

25

Figure 2 illustrates a second embodiment of the device 101, which includes a fan 119 which is arranged below the tank 105, and is provided with a unit for distributing the air on the entire lower surface of the tank.

30

Figure 3 illustrates a third embodiment of the device 203 which is substantially similar to the device of Figure 2 and in which the fan 219 is in a central position.

- 5 Figure 4 illustrates a fourth embodiment which has three different fans 319 arranged around the tank 305.

In a fifth embodiment, illustrated in Figure 5, the device 401 includes two fans 419 which are arranged outside the
10 structure 403.

A sixth embodiment, illustrated in Figure 6, has a device 501 which includes two fans 519, one located outside the structure 503 and the other located inside it.

15

In practice it has been observed that the invention achieves the intended aim and objects, providing a device which allows effective drying of laundry without consuming any water to condense the vapor released by the laundry.

20

The device according to the invention is effective regardless of the system used to evaporate the water from the laundry and of the type of tank of the machine, i.e. enameled steel, stainless steel or plastic.

25

The device according to the invention is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with technically equivalent
30 elements.

Naturally, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

- 5 Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by
- 10 way of example by such reference signs.

CLAIMS

1. Water economizer for combined washing-drying machines which comprise a washing tank, characterized in that it comprises a fan means which is suitable to send air onto the
5 parts of said machine which contain air and vapor so as to cool them, with consequent condensation of said vapor for the drying of said laundry.
2. Device according to claim 1, characterized in that said
10 fan means is suitable to blow air at least onto the walls of said washing tank to cool said tank.
3. Device according to claim 1 or 2, characterized in that said fan means comprises at least one fan arranged inside a
15 structure for supporting said tank.
4. Device according to claim 1 or 2, characterized in that said fan means comprises a plurality of fans which are
20 suitable to blow air onto said washing tank.
5. Device according to claim 1 or 2, characterized in that said fan means comprises one or more fans arranged outside a structure for supporting said tank.
- 25 6. Device according to claim 1 or 2, characterized in that said fan means comprises at least one fan arranged outside a structure for supporting said tank and at least one fan arranged inside said structure.

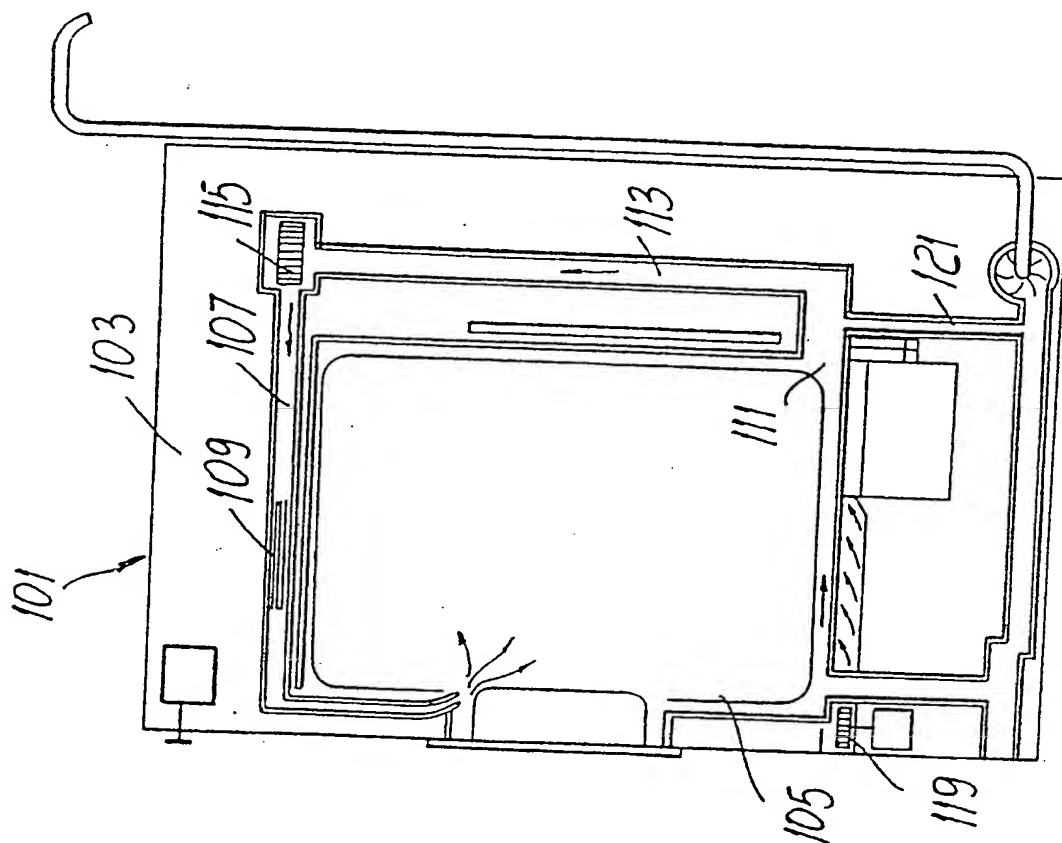


Fig. 2

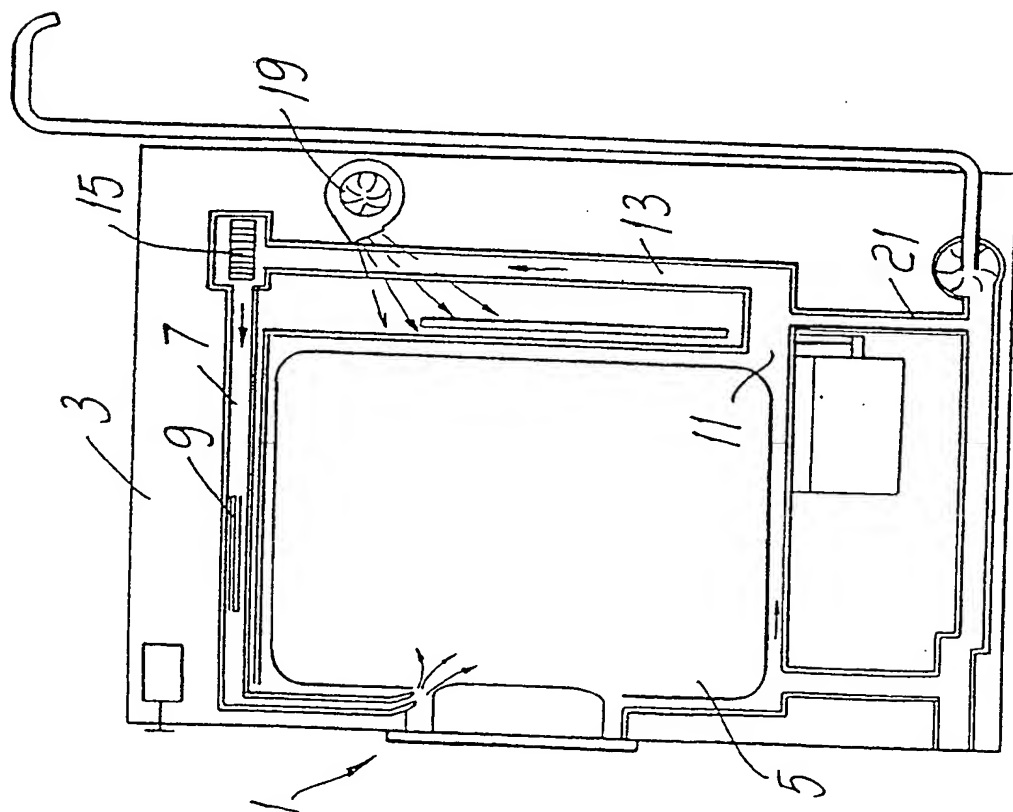


Fig. 1

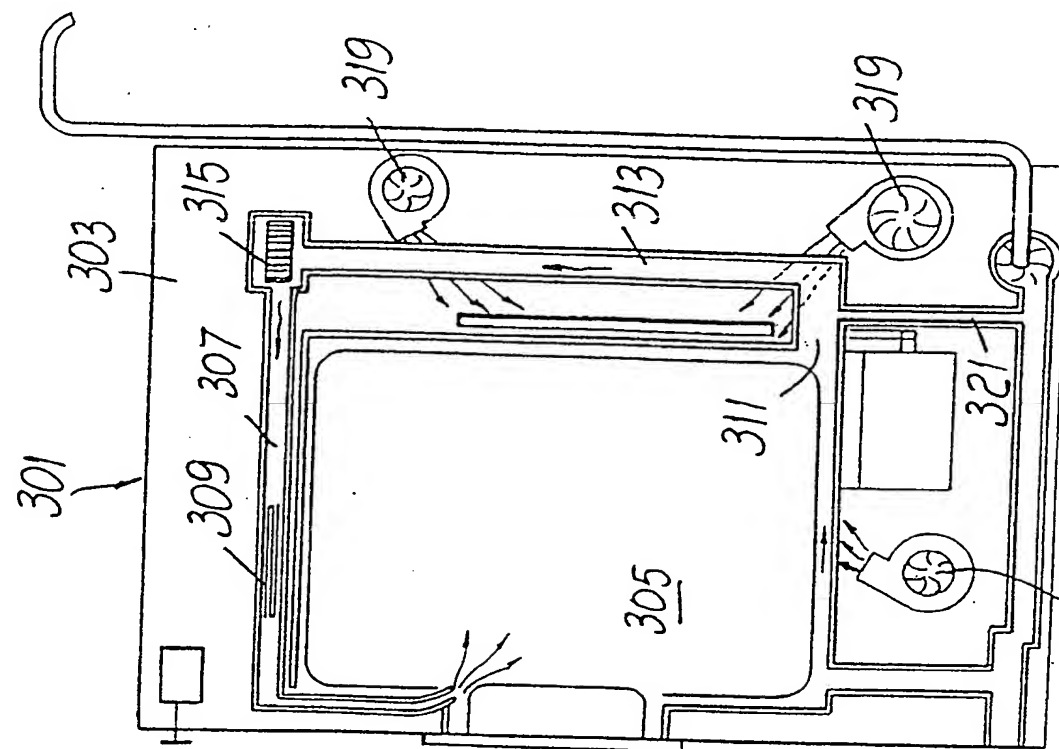


FIG. 3

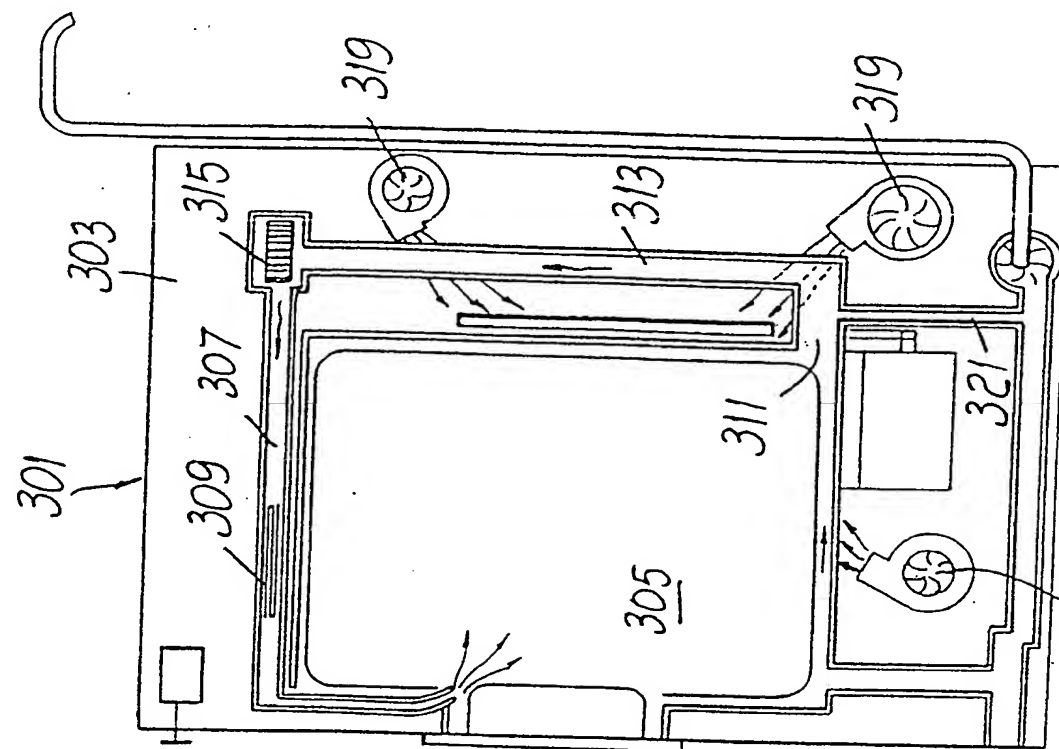
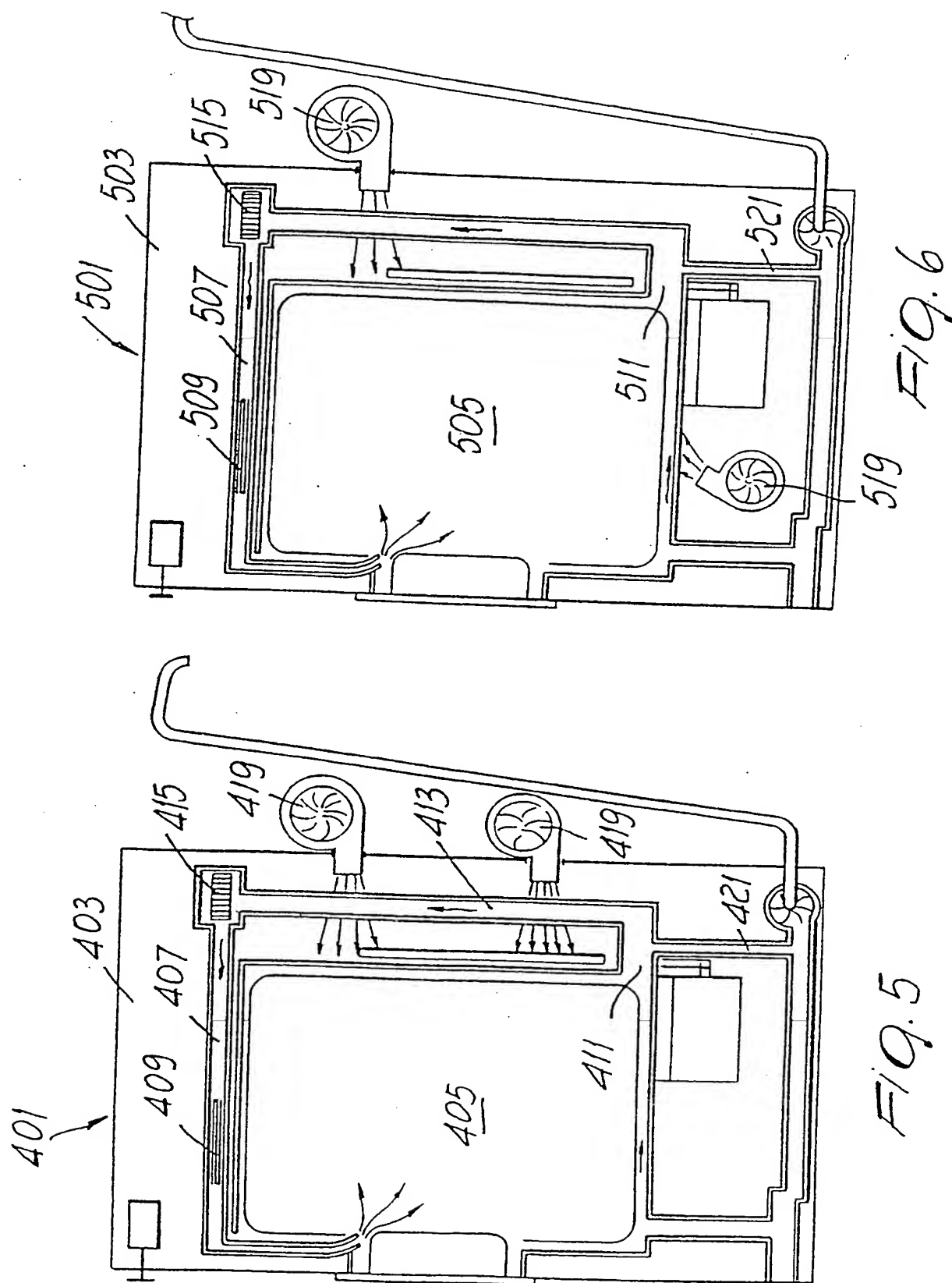


FIG. 4



INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 D06F58/24

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Minimum documentation searched (classification system followed by classification symbols)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| X | PATENT ABSTRACTS OF JAPAN vol. 014, no. 559 (C-0787) 12 December 1990 & JP,A,02 241 486 (HITACHI LTD) 26 September 1990 see abstract | 1-3 |
| X | DE,U,73 36 849 (LICENTIA PATENT-VERWALTUNGS-GMBH) 28 March 1974 see claim; figures | 1-3 |
| A | DE,U,91 03 637 (LICENTIA PATENT-VERWALTUNGS-GMBH) 31 October 1991 see claims 1,3,5; figure 4 | 1-3 |
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| A | <p>DE,A,15 85 986 (SIEMENS-ELECTROGERÄTE GMBH) 25 September 1969 see claims; figure -----</p> | 1 |

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|---|---------------------|----------------------------|---------------------|
| DE-U-7336849 | 28-03-74 | NONE | |
| DE-U-9103637 | 31-10-91 | NONE | |
| US-A-2555821 | | NONE | |
| DE-A-1585986 | 25-09-69 | NONE | |

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